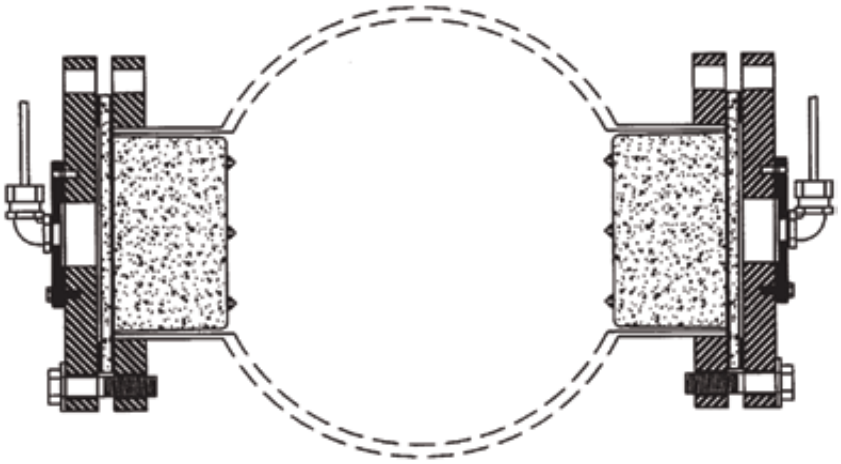
DeltaKit Series

Magnetic Flow Sensor Assemblies

EMCO's DeltaKit Sensor Assemblies convert existing weldable piping from 2" to 80" (50mm to 2000mm) into a highly accurate, non-obtrusive magnetic flow meter. DeltaKit sensors are used with a remote 4411e transmitter. DeltaKit flow sensor assemblies can be used as spare sensor assemblies for UniMag flow tubes.

Features

- Sensors mount flush with internal pipe diameter and do not obstruct flow
- Uses existing weldable pipe work (no liners)
- Low conductivity media > 0.08 mS / cm
- Patented AC coil excitation (high coil current and high pulsation frequency)
- Optional extended electrodes to project through non-fluidic coatings
- Field replaceable sensors
- Inherent redundancy from multiple sensors
- Sensor reference coils
- Internal grounding electrodes
- Accuracy unaffected by media coatings such as calcium carbonate, raw sewage, grease, algae and similar
- High signal-to-noise ratio for immunity to media noise
- Compatible with pulps, slurries, raw sewage and similar



Two DeltaKit sensors with field welded stand pipes.

EMCO DeltaKit flow sensor assemblies are used as spare sensor assemblies for existing flow tubes, or as economic flow meters using existing weldable piping for 2" to 80" (50mm to 2000mm) diameters.

Each sensor includes an exciter coil and reference coil. Voltage is generated in the flow tube by the media in accordance with Faraday's Law, from which volumetric flow is calculated.

DeltaKit sensors are approved by Entela to UL and CSA standards for safety in ordinary locations and NEC and CSA for Class 1, Division 2 or ATEX to Zone 2 explosive atmospheres.

UniMag Technology

Innovative Sensor Technology

- DeltaKit sensors include an exciter coil and a reference coil, and are available in various electrically insulative materials.
- A unique electrode design distributes the magnetic field over the flow tube's entire cross section.
- These combined effects, along with a uniquely powerful field strength, provide a truly weighted velocity signal.
- Each sensor includes a reference coil, separate from the exciter coil.

No Liner Necessary

- Each DeltaKit sensor is a complete solid-state insulated magneter; a liner is not necessary for insulation.

Modular Construction / True Field Repairability

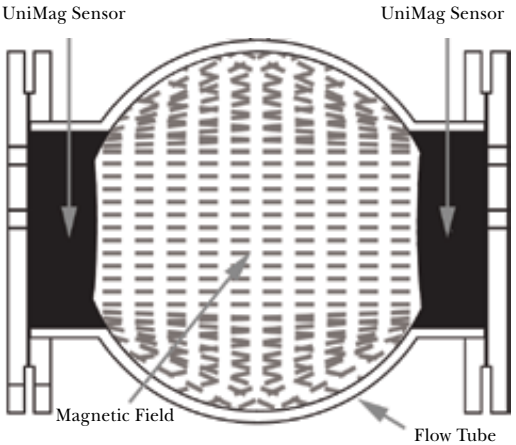
- Sensors can be replaced in the field, meaning minimal downtime and no need to ship the flow tube back to the manufacturer.
- Spare sensors can be kept in stock for easy replacement if needed.
- Output continues if one sensor fails, with 1% to 3% of rate typical accuracy.
- Costly bypass pumping is unnecessary since sensors can be removed and immediately replaced.

Configurations for a Variety of Applications

There are four basic UniMag configurations:

- Sensors with non-obtrusive conical electrodes: used for water, sewage and similar applications
- As above, except with extended conical electrodes: used when media coats the flow tube thick enough to cover standard electrodes
- Concave sensors with flat electrodes; used for dredging slurries and similar moderately abrasive media

UniMag Sensors
Sensor with standard conical electrodes (top) and extended conical electrodes (bottom). Cones wear off with abrasive media. This has no effect on accuracy.



UniMag Magnetic Field
Large UniMag sensors create a magnetic field over the entire flow tube cross section. The flow signal represents the true weighted velocity of the media and is highly insensitive to velocity profile distortion and swirl effects.

Application Guide

	Temperature Range		Maximum Pressure[1]		Notes
	°F	°C	psi	bar	
Sensors					
Polyurethane	175 max.	80 max.	150	10	Conforms to NSF61 and AWWA C213 for drinking water.
PVDF	240 max.	115 max.	150	10	Full vacuum capability. Temperature rating is for water and may be lower for other media. PVDF is approved by the US FDA #21 CFR 177.2510
UHMWPE	175 max.	80 max.	150	10	
PEEK	250 max.	121 max.	356	25	Full vacuum capability.
Sensor Notes	Sensor assembly includes a non-wetted carbon steel cover flange, fusion bonded polyethylene protected. Sensor assemblies are supplied with outer cover flanges, 30 feet (10m) cables, re-enterable potting gel, junction box, conduit and stainless steel bolts. Multiple sensors are pre-wired to the junction box, conduited and potted with re-enterable gel. Temperature differential between process and ambient limited to 140°F (60°C) for polyurethane sensor and 212°F (100°C) for PVDF sensor. Sensors must be removed from standpipe before welding.				

Media Conductivity

Typical required conductivity: > 0.5 µS/cm standard

Low conductivity option: > 0.08 µS/cm on request.

Low conductivity option does not include deionized, distilled or demineralized water; consult EMCO.

Performance Specifications

Accuracy and Traceability[1]	
Accuracy (Single Sensor)	±1.0% of rate for flows ≥ 2.0 fps (0.6 m/s) ±0.02 fps (± 0.06 m/s) for flows < 2.0 fps (0.6 m/s)
Accuracy (Multiple Sensors)	±1.0% of rate for flows ≥ 1.5 fps (0.45 m/s) ±0.015 fps (± 0.0045 m/s) for flows < 1.5 fps (0.45 m/s)
Traceability	Accuracy is traceable to the National Institute of Science and Technology. A NIST traceable Calibration Certificate is provided with each flow tube.
Accuracy Notes	Accuracy is unaffected by electrode coatings such as sewage, grease, calcium carbonate, algae or similar.

1 For media such as ferric chloride, ferric sulfate (Odophos) or similar highly conductive media, flow meter performance can be adversely affected. Please consult EMCO for these types of applications, otherwise performance guarantee is null and void.

Operating Specifications

Flow Range	Minimum	Maximum	Notes
Single Sensor			
fps and m/s	0 to 2 fps (0 to 0.6 m/s)	50 fps (15 m/s)	
gpm	0 to $5D^2$ gpm	$120D^2$ gpm	Where D is in inches
m^3/h	0 to $0.002D^2$ m^3/h	$0.04D^2$ m^3/h	Where D is in millimeters
Multiple Sensors			
fps and m/s	0 to 1.5 fps (0 to 0.4 m/s)	50 fps (15 m/s)	
gpm	0 to $5D^2$ gpm	$120D^2$ gpm	Where D is in inches
m^3/h	0 to $0.002D^2$ m^3/h	$0.04D^2$ m^3/h	Where D is in millimeters

Power Requirements for 4411e Flow Transmitter

Power Supply Options	120V, 60Hz 230V, 50Hz 120V, 50Hz
Analog Output	2 x 4-20 mA 2-wire system
Pulse Output	2-wire potential-free output

Physical Specifications

Materials of Construction	Sensors: Polyurethane, PVDF, UHMWPE or PEEK Standpipe & flanges: Carbon steel, 316 stainless steel
Installation Options	NEMA 6/IP68 indefinitely submersible to 30 foot water column up to 175°F (80°C) NEMA 4X/IP65 for temperatures greater than 175°F (80°C) Entela approved to NEC/CSA Class 1, Division 2, Groups C, D, Temp. T4 Entela approved to ATEX Zone 2 explosive atmospheres

Straight Run Piping Requirements

Piping	Upstream Piping Requirement		Downstream Piping Requirement	
	Single Sensor	Multiple Sensors	Single Sensor	Multiple Sensors
Minimum requirement	10 D	5 D	5 D	3 D
Single elbow or tee upstream	10 D	5 D	5 D	3 D
Two elbows, coupled in the same plane	10 D	5 D	5 D	3 D
Two elbows, close coupled and out of plane	20 D	10 D	5 D	3 D
Pump, blending point, control valve upstream	20 D	10 D	5 D	3 D
Pump, control valve downstream	10 D	10 D	5 D	3 D

D is equal to the internal diameter of the pipe

Measurable Flow Rates at 1.0% Accuracy (Multiple Sensors)

Line Size		Minimum Flow Rate Velocity		Maximum Flow Rate Velocity	
inches	mm	fps	gpm	fps	gpm
2	50	1.5	15	50	490
2.5	65	1.5	23	50	766
3	80	1.5	33	50	1,103
4	100	1.5	59	50	1,960
6	125	1.5	132	50	4,410
8	150	1.5	235	50	7,840
10	200	1.5	368	50	12,250
12	250	1.5	529	50	17,640
14	300	1.5	720	50	24,010
16	350	1.5	941	50	31,360
18	400	1.5	1,191	50	39,690
20	450	1.5	1,470	50	49,000
22	500	1.5	1,779	50	59,290
24	600	1.5	2,117	50	70,560
28	700	1.5	2,881	50	96,040
32	760	1.5	3,763	50	125,440
36	800	1.5	4,763	50	158,760
42	900	1.5	6,483	50	216,090
48	1000	1.5	8,467	50	282,240
54	1200	1.5	10,716	50	357,210
56	1400	1.5	11,525	50	384,160
60	1600	1.5	13,230	50	441,000
66	1700	1.5	16,008	50	533,610
72	1800	1.5	19,051	50	635,040
80	2000	1.5	23,520	50	784,000

Other Installation Considerations

Mounting Recommendations

DeltaKit sensors may be mounted into a pipeline in any attitude, taking note of the flow direction arrow on the sensors. To obtain accurate measurement, the pipe must be completely full and air must not be entrained in the flow.

Straight Run Requirements

For particularly poor velocity profiles caused, for example, by upstream bends in two or more planes or partially open valves, the DeltaKit requires a minimum of 10 pipe diameters of straight pipe upstream from the flow tube, and a minimum of 5 diameters downstream.

Non-Homogenous Media

For particularly non-homogenous slurries, pulps or pastes, the DeltaKit should be installed in a vertical pipe to obtain the most even distribution of solids and fibers. There must be a minimum of 20 pipe diameters between any media mixing point and the DeltaKit sensors.

Partially Closed Valves

If the piping is horizontal and includes a partially closed valve, the valve should always be installed downstream of the DeltaKit. This will allow the head pressure in the system to be adjusted, reducing the chance of air entrainment in the flow, and will prevent excessive irregular profiles forming upstream of the flow sensors.

Vacuum Conditions

For full vacuum, use PEEK sensors only.

Dimensions and Weights

Consult EMCO representative for dimensional information

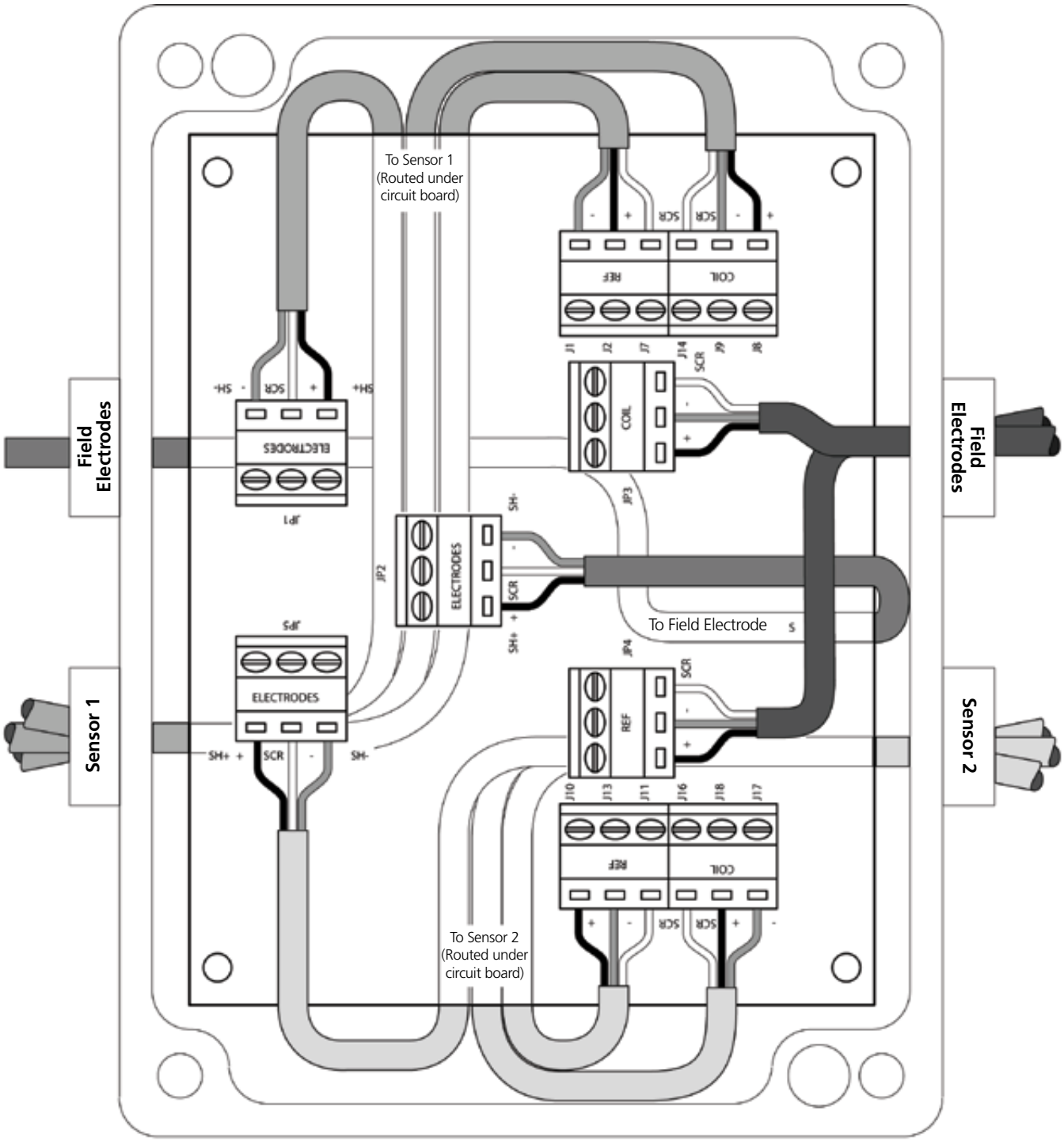
Pipe Size	1 Sensor	2 Sensors	4 Sensors	Single Standpipe and Flange	Sensor Assembly Size
2″ - 3″ (50mm - 80mm)	9 lb (4 kg)	16 lb (8 kg)	N/A	19 lb (9 kg)	2″ (50mm)
4″ - 6″ (100mm - 150mm)	15 lb (7 kg)	27 lb (12 kg)	N/A	24 lb (11 kg)	3″ (80mm)
8″ - 14″ (200mm - 350mm)	38 lb (17 kg)	71 lb (32 kg)	N/A	40 lb (18 kg)	6″ (150mm)
16″ - 24″ (400mm - 600mm)	63 lb (29 kg)	118 lb (54 kg)	N/A	74 lb (34 kg)	8″ (200mm)
28″ - 48″ (700mm - 1200mm)	118 lb (54 kg)	225 lb (102 kg)	440 lb (200 kg)	120 lb (55 kg)	12″ (300mm)
≥ 50″ (1250mm)	118 lb (54 kg)	225 lb (102 kg)	440 lb (200 kg)	120 lb (55 kg)	12″ (300mm)

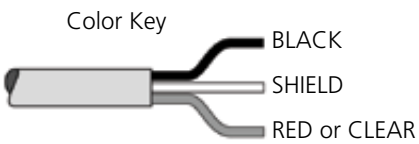
1 Includes weight of sensors and mounting assemblies

2 Add the weight of the standpipe and flange assemblies to the sensor assembly weights to arrive at the total

Wiring Diagrams

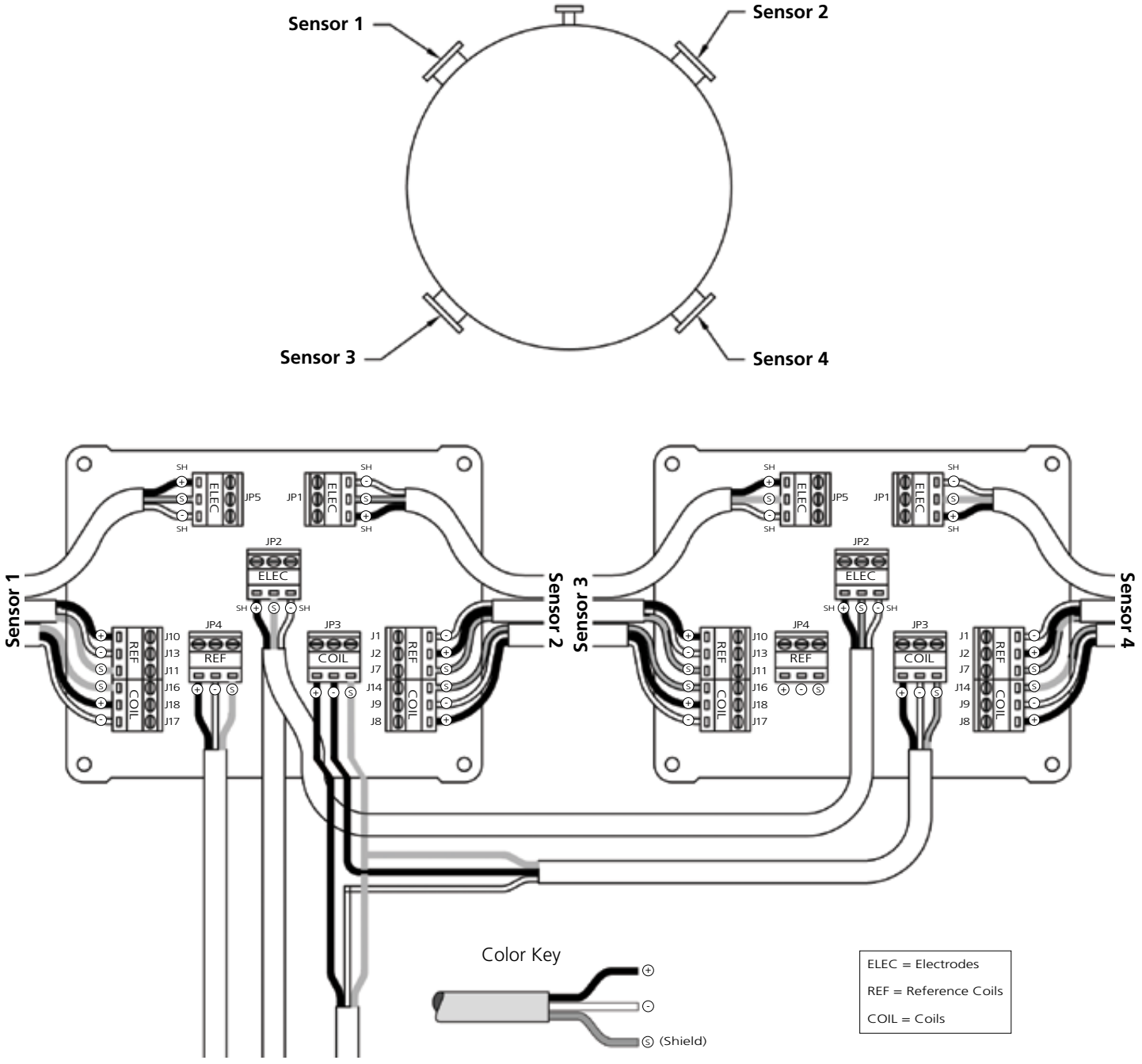
Junction Box Wiring (1 or 2 Sensors)





Wiring Diagrams

Junction Box Wiring (4 Sensors)



Notes

1. Electrodes are connected in parallel.
2. Coils are connected with opposite pairs in parallel, each pair in series.
3. Two reference coils make one set.

Model and Suffix Codes

Category	Suffix Codes									
Model										
DeltaKit Series Sensor Assembly	DK									
Nominal Size										
2 Inches to 80 Inches (50mm to 2000mm)		02 - 80								
Sensor and Gasket Material[2]										
PVDF With Elastomer Gaskets, Viton Seals (Water & Waste, 14" Max. Diameter)			E							
PVDF With Teflon Gaskets, Viton Seals			D							
Polyurethane With Elastomer Gaskets, Viton Seals (Water & Waste, ≥ 36" Diameter)			P							
PVDF With Teflon Gaskets, Kalrez Seals			F							
PEEK With Klinger Gaskets, Chemraz Seals			K							
UHMWPE Concave WIth Elastomer Gaskets, Viton Seals			U							
PEEK With Klinger Gaskets, Teflon Seals[3]			H							
Polyurethane Concave With Elastomer Gaskets, Viton Seals (Water & Waste, 16" to 34" Diameters)			C							
Concave Teflon With Teflon Gaskets, Kalrez Seals			T							
Standpipe / Flange Materials[4]										
Carbon Steel Standpipe For Use In Internally Uncoated Carbon Steel Pipes				C1						
Carbon Steel Standpipe For Use In Internally Coated Carbon Steel Pipes				C2						
316 Stainless Steel Standpipe For Use In Internally Uncoated Stainless Steel Pipes[5]				T1						
316 Stainless Steel Standpipe For Use In Internally Coated Stainless Steel Pipes[5]				T2						
316 Stainless Steel Standpipe For Use In Internally Uncoated Carbon Steel Pipe[5]				A1						
316 Stainless Steel Standpipe For Use In Internally Coated Carbon Steel Pipe[5]				A2						
No Standpipes, For Use In Internally Uncoated Carbon Steel Pipes				O1						
No Standpipes, For Use In Internally Coated Carbon Steel Pipes				O2						
No Standpipes, For Use In Internally Uncoated Stainless Steel Pipes				N1						
No Standpipes, For Use In Internally Coated Stainless Steel Pipes				N2						
For Use With PVC / HDPE Flow Tubes				SS						

Category	Suffix Codes									
Sensor / Standpipe Assembly Quantity and Size										
For Pipes 2" to 20" (50mm to 500mm) 1 Sensor, No Standpipe					A					
For Pipes 2" to 20" (50mm to 500mm) 1 Sensor, 1 Standpipe					B					
For Pipes 2" to 48" (50mm to 1200mm) 2 Sensors, No Standpipes					C					
For Pipes 2" to 48" (50mm to 1200mm) 2 Sensors, 2 Standpipes					D					
For Pipes ≥ 50" (1250mm) 4 Sensors, No Standpipes					E					
For Pipes ≥ 50" (1250mm) 4 Sensors, 4 Standpipes					F					
Electrodes										
AISI 316 Stainless Steel						T				
Hastelloy B (Small)						B				
Hastelloy C (Small)						C				
Titanium						I				
Hastelloy C (Large)[6]						W				
Hastelloy B (Large)[6]						X				
Tantalum						A				
Hastelloy C High Compression[3]						H				
Monel						M				
Coil Supply										
120V Coil Supply							A			
230V Coil Supply							B			
Approvals and Installation										
Junction Box Potted to NEMA 6 and IP68 Submersible to 50' (15m) (Standard Supply)								1		
As Option R Above, Except With Weldable Junction Box Support Table								2		
Entela Approved To NEC / CSA Class 1, Div. 2, Groups C, D, Temp T4, 50' (15m) Cable								3		
Entela Approved To ATEX Zone 2, 50' (15m) Cable								4		
Special, Including Special Cable Length[1]								5		

Category	Suffix Codes									
Pressure Rating										
150 PSI (10 Bar G)									1	
300 PSI (16 Bar G)									2	
Special[1]									S	
NIST Traceable Flow Calibration										
Calibration Based On Actual Pipe Size										A
Uncalibrated (Approved Export Manufacturing Partners Only)										B
	DK	24	E	C1	D	T	A	R	1	A

1 All special orders must include a complete description along with the ordering code. Always use the "Special" option for combinations. Contact factory for pricing.

2 Sensor assembly includes a non-wetted carbon steel cover, fusion bonded polyethylene.

3 Use H electrodes on paper mill liquors and lime mud > 200ºF (93ºC). Use with H sensors only. Use with Ryton internally coated UniMag flow tubes only.

4 Standpipes have temporary epoxy enamel finish. The junction box assembly includes conduit and non-wetted outer cover carbon steel flange. Single sensors have the junction box attached directly to the outer cover flange. Standard supply is 50 feet (15m) cables.

5 Stainless steel standpipes have carbon steel flanges welded on, unless otherwise specified.

6 Use with W or X electrodes with K (PEEK) sensors only, for paper mill liquors and lime mud > 200ºF (93ºC). Use with Ryton internally coated UniMag flow tubes only.

EMCO Flow Systems is a division of Spirax Sarco, Inc. • 1150 Northpoint Blvd. • Blythewood, SC 29016

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